

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 10-295068

(43)Date of publication of application : 04.11.1998

(51)Int.Cl.

H02K 29/00
H02K 5/22
H02K 15/02
H02K 21/22
// H02K 7/04

(21)Application number : 09-101280

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(22)Date of filing : 18.04.1997

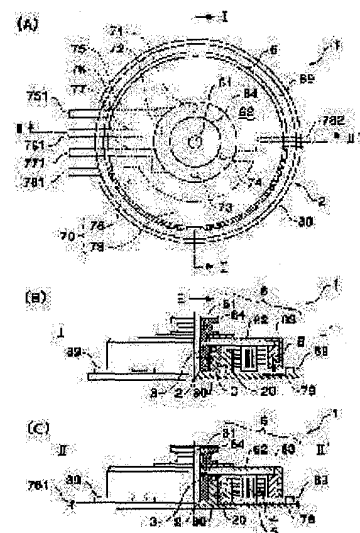
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(54) BRUSHLESS MOTOR AND ITS MANUFACTURING METHOD

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a brushless motor for positively and inexpensively preventing a rotary shaft from swinging by utilizing a configuration, where a wiring pattern is formed for utilizing the substrate of the motor as a circuit substrate, and its manufacturing method.

SOLUTION: A stator substrate 2 of a brushless motor 1 is a single body molding between an iron plate 70 and a resin 80. A wide circular part 79 of a wiring pattern 78 that is constituted by one portion of the iron plate 70 is constituted at one-side region for a rotary shaft 60 of a rotor 6. Therefore, since the stator substrate 2 attracts the rotor 6 to one side, a rotary shaft 61 is subjected constantly to a side pressure and does not cause irregular swings, even if a relatively large clearance exists between a combustion oil-less bearing 3 and the rotary shaft 61.



LEGAL STATUS

[Date of request for examination]

25.09.2000

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

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CLAIMS

[Claim(s)]

[Claim 1] The drive coil held at the base side, and the bearing held at the aforementioned base side, In the brushless motor which has Rota rotated on the aforementioned base by the magnetism which it is supported through the rotation axis supported by this bearing free [rotation] at the aforementioned base side, and is generated between the aforementioned drive coil and the Rota magnet The wiring pattern with which the aforementioned base was installed from the terminal area by which wiring connection of the edge of the aforementioned drive coil is made, and this terminal area, And the inside of the field which stands face to face against the aforementioned Rota magnet, The brushless motor characterized by consisting of the one mold goods of the magnetic plate and resin which constitute the Rota suction section which generates the magnetic-attraction force which is unevenly distributed in the field of one side to the center-of-rotation position of aforementioned Rota, and draws aforementioned Rota near to this one side between the aforementioned Rota magnets.

[Claim 2] It is the brushless motor characterized by having the broad radii section corresponding to this Rota magnet configuration in part of the field where the aforementioned wiring pattern stands face to face against the aforementioned Rota magnet in a claim 1, and the aforementioned Rota suction section being constituted by this radii section.

[Claim 3] It is the brushless motor characterized by manufacturing the aforementioned magnetic plate by press working of sheet metal in a claim 1.

[Claim 4] In the manufacture technique of the brushless motor specified to the claim 1 or either of 3 The press process formed in the status perform press working of sheet metal to the plate used as the raw material of the aforementioned magnetic plate, and connect the aforementioned terminal area, the aforementioned wiring pattern, and the aforementioned Rota suction section to the frame section, the aforementioned terminal area among the aforementioned plates which passed through this press process, the aforementioned wiring pattern, and the aforementioned Rota suction section -- metal mold -- inside -- containing -- this -- metal mold -- with the mould process which performs resin molding inside and forms a resin mould article The aforementioned terminal area, the aforementioned wiring pattern, and the plastic surgery process that separates the aforementioned Rota suction section from the aforementioned frame section, and operates the aforementioned resin mould article orthopedically to the aforementioned base, The manufacture technique of the brushless motor characterized by having as the aforementioned drive coil, the aforementioned bearing, and the erector that carries aforementioned Rota to the aforementioned base.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] this invention relates to the structure technique for stabilizing the deflection of a rotation axis still in detail about a brushless motor and its manufacture technique.

[0002]

[Description of the Prior Art] A stator core is fixed to the motor substrate side which serves as the base of a motor from the former by the capstan motor for VTR among a certain motors of various kinds of, and the drive coil is wound around the salient pole of this stator core. Bearing is also fixed to a motor substrate side and the rotation axis rotated to the Rota case and one is supported by this bearing. The Rota magnet fixes so that the inner skin of the Rota case may be countered in the periphery side of a stator core, and Rota rotates by the magnetism generated between this Rota magnet and drive coil.

[0003] Here, by the oil impregnated sintered bearing, although it replaces with a ball bearing and a cheap oil impregnated sintered bearing is used as bearing, since comparatively big path clearance occurs between axes, in case Rota rotates, an irregular deflection like a precession tends to happen to a rotation axis. As technique for preventing the deflection with such an irregular rotation axis, a spinning etc. is performed to the field which stands face to face against the Rota magnet among yoke plates (griddle), a concavity and a heights are formed at JP,5-10547,Y, and invention Rota enabled it to always draw near to one side is indicated by attaching strength to the magnetic-attraction force generated between the Rota magnet and a yoke plate. Moreover, magnetic-substance powder is applied only to one side to the center-of-rotation position of Rota among motor substrates, and invention Rota enabled it to always draw near to one side is indicated by JP,4-58065,U using the magnetic-attraction force generated between this magnetic-substance powder and the Rota magnet.

[0004]

[Problem(s) to be Solved by the Invention] However, by the technique of performing a spinning to a yoke plate between two above-mentioned invention, and forming a concavity and a heights, since irregularity cannot be formed deeply or highly any more, big strength is attached to the magnetic-attraction force generated between the Rota magnet and a yoke more than this, and there is a trouble where there is no **. Moreover, since sublation will arise to a wiring pattern in case irregularity is formed in a yoke plate if a wiring pattern tends to be printed on the front face of a yoke plate through an insulator layer and it is going to use it for it as a motor substrate, there is a trouble where such technique is inapplicable in a motor substrate. On the other hand, by the technique of applying magnetic-substance powder to a motor substrate, there is a trouble where the work for it takes time.

[0005] Even if it does not use the irregularity which formed the technical problem of this invention in the yoke plate by the spinning in view of the above trouble And even if it does not add the new process of applying magnetic-substance powder, in order to use the base of a motor as circuit board, the configuration of forming a wiring pattern is used for a base. It is in offering the brushless motor which can prevent the deflection with an irregular rotation axis certainly and cheaply, and its manufacture technique.

[0006]

[Means for Solving the Problem] The drive coil held in this invention at the base side in order to solve the above-mentioned technical problem, It is supported at the aforementioned base side through the bearing held at the aforementioned base side, and the rotation axis supported by this bearing free [rotation]. In the brushless motor which has Rota rotated on the aforementioned base by the magnetism generated between the aforementioned drive coil and the Rota magnet the aforementioned base The terminal area by which wiring connection of the edge of the aforementioned drive coil is made, the wiring pattern installed from this terminal area, And the center-of-rotation position of aforementioned Rota of the fields which stand face to face against the aforementioned Rota magnet is received. It is characterized by consisting of the one mold goods of the magnetic plate and resin which constitute the Rota suction section which generates the magnetic-attraction force which is unevenly distributed in the field of one side, and draws aforementioned Rota near to this one side between the aforementioned Rota magnets.

[0007] The Rota suction section constituted from a brushless motor concerning this invention with a part of aforementioned magnetic plate to the field of one side to the center-of-rotation position of Rota by the field which stands face to face against the Rota magnet at the base side which consisted of the one mold goods of a magnetic plate and a resin is arranged, and this Rota suction section is generating the magnetic-attraction force between the Rota magnets. Therefore, since strength has the magnetic-attraction force of acting on the Rota magnet, by the location with the existence of the Rota suction section, the Rota suction section will draw Rota near to one side. So, even if comparatively big path clearance occurs between bearing and a rotation axis, since a rotation axis is in the status that the lateral pressure is always received, an irregular deflection does not happen. And since strength is prescribed by the existence of the Rota suction section, with the irregularity formed in the magnetic plate by the spinning, the magnetic-attraction force of acting on the Rota magnet is different from the case where extensive ** is

attached to the gap of the Rota magnet and a magnetic plate, and can attach big strength to the magnetic-attraction force. Therefore, the deflection with an irregular rotation axis can be prevented certainly. Moreover, in case the conductive plate and conductive resin which constitute a wiring pattern are really fabricated and the aforementioned base is constituted as circuit board, as a plate, a magnetic plate is used and the aforementioned Rota suction section consists of a part of this magnetic plate. That is, since the process for constituting a base as circuit board is used for as it is and the Rota suction section is constituted, the number of processes does not increase. Therefore, the deflection of the rotation axis of a brushless motor can be prevented cheaply.

[0008] In this invention, to the aforementioned wiring pattern, the broad radii section corresponding to this Rota magnet configuration in part of the field which stands face to face against the aforementioned Rota magnet may be constituted, and the radii section of this **** may be used as the aforementioned Rota suction section as it is.

[0009] It is desirable to manufacture the aforementioned magnetic plate cheaply by press working of sheet metal in this invention.

[0010] In manufacturing the brushless motor of such a configuration The press process formed in the status perform press working of sheet metal to the plate used as the raw material of the aforementioned magnetic plate, and connect the aforementioned terminal area, the aforementioned wiring pattern, and the aforementioned Rota suction section to the frame section, the aforementioned terminal area among the aforementioned plates which passed through this press process, the aforementioned wiring pattern, and the aforementioned Rota suction section -- metal mold -- inside -- containing -- this -- metal mold -- with the mould process which performs resin molding inside and forms a resin mould article It carries out as the plastic surgery process which separates the aforementioned terminal area, the aforementioned wiring pattern, and the aforementioned Rota suction section from the aforementioned frame section, and operates the aforementioned resin mould article orthopedically to the aforementioned base, and the erector who carries the aforementioned drive coil, the aforementioned bearing, and aforementioned Rota to the aforementioned base. That is, since it is not necessary to add the new process of applying magnetic-substance powder, the brushless motor which an irregular deflection does not generate in a rotation axis can be manufactured cheaply.

[0011]

[Embodiments of the Invention] The brushless motor which applied this invention is explained with reference to a drawing.

[0012] (Whole structure) View 1 (A), (B), and (C) are the plan of the brushless motor 1 which applied this invention, a fragmentary sectional view in the I-I' line, and a fragmentary sectional view in the II-II' line, respectively.

[0013] As shown in drawing 1 (A), (B), and (C), the brushless motor 1 of this gestalt is a capstan motor for VTR, and the cylinder-like salient 20 is formed in the stator substrate 2 at a part for the center section. the center of this salient 20 -- an oil impregnated sintered bearing 3 is held inside a hole, and the stator core 4 is inserted in the outside of salient 20 The drive coil 5 of a three phase circuit (U phase, V phase, W phase) is wound around each of the salient pole of a stator core 4. The rotation axis 61 of Rota is supported by the oil impregnated sintered bearing 3 free [rotation], and the Rota case 62 fixes in the rotation axis 61. In the inner skin of the lateral portion of the Rota case 62, the ring-like Rota magnet 63 fixes so that the periphery side of a stator core 4 may be countered. Therefore, the Rota case 62 rotates to a rotation axis 61 and one by the magnetism generated between the Rota magnet 63 and the drive coil 5. Here, a pulley 64 is constituted by the top section of the Rota case 62, and a brushless motor 1 transmits driving force through the belt (not shown) hung on this pulley 64.

[0014] (Configuration of the stator substrate 2) View 2 (A), (B), and (C) are the plan of a stator substrate (a base / core electrode holder) used for the brushless motor which applied this invention, a cross section in the III-III' line, and a cross section in the IV-IV' line, respectively.

[0015] With this gestalt, the stator substrate 2 is used also as circuit board which performs electric supply to a drive coil 5. That is, as shown in drawing 2 (A) - (C), three terminal areas 71, 72, and 73 by which the stator substrate 2 stands up by four places in the periphery of salient 20, and wiring connection of the terminal of the drive coil 5 of each phase (U phase, V phase, W phase) is made, and one terminal area 74 by which all the terminals of the drive coil 5 of a three phase circuit are common, and wiring connection is made are constituted. The wiring patterns 75, 76, 77, and 78 are installed in one, and the external terminal areas 751, 761, 771, 781, and 782 are constituted from a soffit fraction of terminal areas 71-74 by the edge of each wiring patterns 75, 76, 77, and 78, respectively. Among these external terminal areas 751, 761, 771, 781, and 782, the external terminal areas 751, 761, and 771 of each phase and the common external terminal area 781 are arranged so that it may jut out of one edge 21 of the stator substrate 2, and the common external terminal 782 is arranged so that it may ***** from the other-end edge 22 of the stator substrate 2.

[0016] After the four aforementioned terminal areas 71-74 and four wiring patterns 75-78 perform press working of sheet metal to one griddle (magnetic plate) so that each may be mentioned later, the insert molding of them is carried out. Namely, the griddle 70 (magnetic plate) which constitutes four terminal areas 71-74 of the above [the stator substrate 2], and four wiring patterns 75-78, They are the one mold goods (insertion mould substrate) with the heat-resistant high resin 80 of PBT, PPS or 66 nylon, etc., etc. Almost all fractions have exposed any wiring patterns 75-78 from the fraction of a resin 80 in the front face of the stator substrate 2 (in drawing 2 (A), the oblique line is given to a part for this outcrop.).

[0017] In the front-face side of the stator substrate 2, the reinforcing rib 89 formed so that the outside of the Rota case 62 might be surrounded has projected. In addition, a thin insulator layer may be formed in the front face of the stator substrate 2, and the wiring patterns 75-78 may be covered with this thin insulator layer.

[0018] Here, the formation field of four wiring patterns 75-78 is constituted so that it may be unevenly distributed in the field of one side to the rotation axis 61 of Rota 6 among the fields which stand face to face against the Rota magnet 63. That is, the fraction which the wiring pattern 78 for making the terminal of a drive coil 5 into common potential among four wiring patterns 75-78 passes along one side from one edge 21 of the stator substrate 2 to the rotation axis 61 of Rota, and passes along the field

which stands face to face against the Rota magnet 63 although it is formed so that the other-end edge 22 may be reached serves as the broad radii section 79. For this reason, it has countered with the area with large Rota magnet 63 and broad radii section 79 of the wiring pattern 78. On the other hand, any of other three wiring patterns 75-77 with width of face thin [the fraction of the others of the common wiring pattern 78] and -- although -- since it is a pattern with narrow width of face, in the field except the aforementioned broad radii section 79, the opposite area of the Rota magnet 63 and the wiring patterns 75-78 is very narrow [0019] (Effect of this gestalt) In the brushless motor 1 constituted in this way, since the oil impregnated sintered bearing 3 cheap as bearing which supports a rotation axis 61 was used, comparatively big path clearance exists between a rotation axis 61 and the inner skin of an oil impregnated sintered bearing 3. Therefore, with structure as it is, in case Rota 6 rotates, it is going to cause the deflection with an irregular rotation axis 61 within an oil impregnated sintered bearing 3. However, among the fields which stand face to face against the Rota magnet 63, to the center-of-rotation position (rotation axis 61) of Rota 6, the broad radii section 79 of the wiring pattern 78 which consisted of a part of griddle is arranged, and this broad radii section 79 functions on the field of one side with this gestalt as Rota suction section which generates the magnetic-attraction force (arrow head B shows.) between the Rota magnets 63. Therefore, the magnetic-attraction force of acting between the stator substrate 2 and the Rota magnet 63 is strong at the side with the broad radii section 79, and does not exist in the opposite side. That is, by the existence of the radii section 79 with the broad magnetic-attraction force of acting between the stator substrate 2 and the Rota magnet 63, since there is strength, the stator substrate 2 (broad radii section 79) will draw Rota 6 near to one side with the location. Consequently, even if comparatively big path clearance occurs between an oil impregnated sintered bearing 3 and the rotation axis 61, since a rotation axis 61 is always in the status that the lateral pressure is received as arrow head C shows, an irregular deflection like a precession does not happen. And since strength is prescribed by the existence of the broad radii section 79 as Rota suction section, the magnetic-attraction force of acting on the Rota magnet 63 can attach big strength to the magnetic-attraction force.

[0020] (The manufacture technique of a brushless motor 1) Such a blas loess motor of a configuration is manufactured by the technique explained below.

[0021] **** which serves as terminal areas 71-74, the wiring patterns 75-77, and the Rota suction section as press working of sheet metal is first performed to a large-sized griddle and the manufacture technique of the brushless motor 1 concerning this gestalt is shown in drawing 3 -- it pierces in the status connect the wiring pattern 78 equipped with the broad radii section 79 to the rectangular frame section 701 (press process) Moreover, about terminal areas 71-74, it is processed for making it stand up.

[0022] next, the wiring pattern 78 equipped with terminal areas 71-74, the wiring patterns 75-77, and the broad radii section 79 among the griddles 700 which passed through the press process -- metal mold -- inside -- containing -- this -- metal mold -- resin molding is performed inside and a resin mould article is formed (mould process) Of course, it does not cover by the resin 80 so that wiring connection of a coil may be possible about terminal areas 71-74 later. In addition, the periphery profile of a resin mould article is expressed with alternate long and short dash line L to drawing 3 .

[0023] Next, it operates orthopedically to the stator substrate 2 which separated from the frame section 701 in the position which shows the wiring patterns 75-77 and the wiring pattern 78 equipped with the broad radii section 79 by arrow head F, and showed the resin mould article in drawing 2 (plastic surgery process).

[0024] Next, as shown in drawing 1 , a drive coil 5, the oil impregnated sintered bearing 3, and Rota 6 are carried to the stator substrate 2 (as the erector).

[0025] Thus, since the process for constituting the stator substrate 2 as circuit board is used for as it is and the Rota suction section (broad radii section 79) is constituted, the number of processes does not increase. Therefore, the irregular deflection of the rotation axis 61 of a brushless motor 1 can be prevented cheaply. Then, in case it carries in a set, using a brushless motor 1 as the captan motor for VTR, a brushless motor 1 is arranged to the sense the orientation which the lateral pressure shown in drawing 1 (B) by arrow head C requires, and whose orientation (arrow head E) pulled by the belt hung on the pulley 64 correspond.

[0026] [the gestalt of other operations] -- **** which becomes the common wiring pattern 78 with the Rota suction section with the above-mentioned gestalt in addition -- **** from which **** becomes the other wiring patterns 75-77 with the Rota suction section with the configuration of having formed the broad radii section 79 -- you may form the broad radii section 79

[0027] Moreover, the fraction which should serve as the Rota suction section may have which wiring patterns 75-78 in the insulating status electrically. **** which serves as the Rota suction section separately from them while the terminal areas 71-74 and the wiring patterns 75-78 are formed in it, as press working of sheet metal is performed to a large-sized griddle and it is shown in drawing 4 -- what is necessary is just to form the broad radii section 79 In this case, since the broad radii section 79 (Rota suction section) is in the status that it dissociated with the wiring patterns 75-78, it connects the broad radii section 79 and the frame section 701 through the link section 702 before the insert molding, and separates the link section 702 after an insert molding in the position shown by arrow head F. Thus, by the existence of the broad radii section 79 (Rota suction section), even when constituted, as explained with reference to drawing 1 (B), since strength has the magnetic-attraction force of acting on the Rota magnet 63, it draws Rota 6 near to one side with the location. So, since a rotation axis 61 is in the status that the lateral pressure is always received even if comparatively big path clearance occurs between an oil impregnated sintered bearing 3 and the rotation axis 61, the same effect as the gestalt of the above mentioned operation -- an irregular deflection does not happen -- is done. Moreover, although the broad radii section 79 has dissociated [the wiring patterns 75-78 and] and has been independent, since it uses the process for constituting the stator substrate 2 as circuit board for as it is and forms it, it does not need to increase a manufacturing process and can prevent cheaply the deflection of the rotation axis 61 of a brushless motor 1. as well as the above mentioned gestalt of operation]

[0028] Furthermore, about the stator substrate 2, it is not as a base of a motor, and you may constitute as a part of chassis of a set (electric product).

[0029]

[Effect of the Invention] As explained above, it has the characteristic feature for the Rota suction section constituted from a brushless motor concerning this invention with a part of magnetic plate to the field of one side to the center-of-rotation position of Rota by the field which stands face to face against the Rota magnet at the base side which consisted of the one mold goods of a magnetic plate and a resin to be arranged. Therefore, according to this invention, by the location, the Rota suction section will generate the big magnetic-attraction force with strength, and will draw Rota near to one side. So, even if comparatively big path clearance occurs between bearing and a rotation axis, since a rotation axis is in the status that the lateral pressure is always received, an irregular deflection does not happen. Moreover, since the process for constituting a base as circuit board is used for as it is and the Rota suction section is constituted, the number of processes does not increase. Therefore, the deflection of the rotation axis of a brushless motor can be prevented cheaply.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] (A), (B), and (C) are the plan of the brushless motor which applied this invention, a fragmentary sectional view in the I-I' line, and a fragmentary sectional view in the II-II' line, respectively.

[Drawing 2] (A), (B), and (C) are the plan of a stator substrate used for the brushless motor 1 which applied this invention, a cross section in the III-III' line, and a cross section in the IV-IV' line, respectively.

[Drawing 3] In order to form the stator substrate shown in drawing 2, it is the plan showing a mode after performing press working of sheet metal to a griddle.

[Drawing 4] In order to form the stator substrate used for another brushless motor which applied this invention, it is the plan showing a mode after performing press working of sheet metal to a griddle.

[Description of Notations]

- 1 Brushless Motor
- 2 Stator Substrate (Base)
- 3 Oil Impregnated Sintered Bearing
- 4 Stator Core
- 5 Drive Coil
- 6 Rota
- 61 Rotation Axis
- 62 Rota Case
- 63 Rota Magnet
- 64 Pulley
- 70 Griddle (Magnetic Plate)
- 71-74 Terminal area
- 75-78 Wiring pattern
- 79 Broad Radii Section (Rota Suction Section)
- 80 Resin
- 89 Reinforcing Rib
- 700 Griddle after Press Process
- 701 Frame Section

[Translation done.]